Forintek Canada Corp.

Annual Report 1984-85

85-5876/

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President & Chief Executive Officer

Jacques Carette
Director, Eastern Region

Jim Dangerfield
Director, National Programs

Bob Stephens
Director, Western Region

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Director and Consultant
Weldwood of Canada Limited

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Canadian Forest Products Ltd.

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Commerce & Development
Province of New Brunswick

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Council of Forest Industries of British Columbia

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Research and Development
MacMillan Bloedel Limited

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Forintek Canada Corp.

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Canadian Forestry Service

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Waferboard Corporation Limited

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Federated Co-operatives Ltd.

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Consumer Goods Services and Resources Processing
Department of Regional Industrial Expansion

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Canadian Forestry Service
Agriculture Canada

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Associate Dean, Forestry
Faculty of Agriculture & Forestry
University of Alberta

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President
Rustad Bros. & Co. Ltd.

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General Manager
Alberta Forest Products Association

H.G. Sander
President
Northwood Pulp & Timber Ltd.

G. Saucier
President and Chief Executive Officer
Le Groupe Gérard Saucier Ltée

G. Tardif
President and Executive Director
Les Industries Maibec Inc.

SECRETARY
J. Carette
Forintek Canada Corp.

Board Committees

Members

The Audit Committee reviews any changes to accounting principles and the annual audit, and approves the financial statements on behalf of the Board.

I.A. Barclay, R.R. Affleck, A. McPherson, G.L. Pearson, J. Perron

The Pension Investment Advisory Committee assists and guides the Pension Committee in matters related to the financial performance of the Forintek Pension Fund.

I.A. Barclay, P.U. Desjardins, K.A. French, H.G. Sander

The Membership Advisory Committee assists management in recruiting members and in overseeing membership relations.

J. Perron, P.U. Desjardins, N.R. Dusting, K.A. French, G. Malette, G. Saucier

The Research Program Committees provide advice and guidance on the orientation of research and development programs, relate the programs to the immediate and long term needs of the wood products industry, and provide advice on the industrial application of Forintek work.

Western Directors Elected:
N.R. Dusting, R.R. Affleck, J.M. Rustad, K.A. French
Eastern Directors Elected:
R.A. Nugent, G. Malette, G. Tardif, K.A. French

The Executive Committee acts on behalf of the Board in the intervals between Board meetings. It also approves all membership applications.

J. Perron, P.U. Desjardins, N.R. Dusting, K.A. French, R.A. Nugent, H.G. Sander

The Nominating Committee presents the Board nominees for election at the Annual Meeting of Members.

P.U. Desjardins, J. Perron, H.G. Sander

Message from the Chairman and the President

We are pleased to report that the past year has been a very significant one for Forintek Canada Corp. Our new industry membership program was launched; our research and development programs have produced some notable achievements that will support the technological advancement of the Canadian wood products industry; and we have introduced strategic planning to provide a clear sense of purpose for the Corporation.

Our new industry membership program came into effect on April 1, 1984. Elsewhere in this report are listed the 104 companies from all regions of Canada that have become members of Forintek. A member of Forintek is a company manufacturing wood products in Canada that has agreed to financially support Forintek research and development programs. The members pay a monthly assessment based on shipments in the prior month.

The industry membership campaign was assisted by the major wood products industry associations across Canada. The associations have strongly promoted the program, facilitated communications and assisted with invoicing. The support of these associations has been invaluable and is gratefully acknowledged.

Prior to April 1, 1984, our revenue from industry was much lower, and was derived from voluntary contributions from about 25 companies. The support and encouragement from those companies during our transition to the private sector is very gratefully acknowledged.

Our membership program is the key to a unique partnership in wood products research in Canada between industry, the federal government and the provinces. The partnership is based on a funding formula which requires industry to contribute 25 percent of Forintek's annual revenue. Total industry revenue is now about $2.9 million per year. The provinces will provide 25 percent and the federal government will provide 50 percent. The target has essentially been achieved in the first year of operation.

The federal government, through the Canadian Forestry Service, supports programs that provide the opportunity for Forintek to be the major impartial centre of technical support to codes and standards committees that govern the use of Canadian wood products in domestic and export markets. Other programs include resource utilization, training, education and technology transfer. The results of the past year's work are summarized in the Executive Report, Canadian Forestry Service Contribution Agreement 1984/85, available on request.

The Province of British Columbia has been a supporter of Forintek since its inception in 1979 and has been joined by Alberta, Ontario, Quebec, New Brunswick, and Nova Scotia. The provinces support programs of interest to their respective regions of Canada.

Forintek's Board includes senior executives from the major sectors of the wood industry in Canada, the federal government and the provinces. The directors have made a strong commitment to the success of Forintek. The time and advice that they contribute to

Forintek is invaluable, and very much appreciated by management and staff.

During the past year our research and development programs produced some notable achievements that are described in this report. We have conducted an aggressive technology transfer program in the lumber and panel products sectors. There have been significant innovations such as a spindleless lathe to produce veneer more economically and a promising new moisture sensor developed for veneer and lumber. Novel methods to control the dimensional stability of waferboard have been developed and patents applied for. Achievements in every department reflect the commitment of Forintek staff to ensure the technological advancement of the Canadian wood products industry.

We have introduced strategic planning to provide a clear sense of purpose for Forintek. The process we adopted involved consultation with Forintek staff, members of the Board, and many members of our Research Program Committees. Our mission is to be the leading force in the technological advancement of the Canadian wood products industry, through the creation and implementation of innovative concepts, processes, products and education programs.

Our programs can be grouped into two broad categories. Forintek's industry and government partners in the various regions of Canada require programs directed towards resource utilization, cost competitiveness, productivity improvement, product development, training and skill development. These programs emphasize applied research and technology transfer.

We also have programs that do not have a specific regional focus, and can span various product sectors. These programs — in wood characterization, wood engineering and biotechnology — are referred to as our national programs. They address the more fundamental research opportunities and involve long term research. The national programs also include a strengthened economics and market research function for the benefit of all our programs.

These program categories led to a new organization structure that was formalized April 1, 1985. Bob Stephens was appointed Director, Western Region and Jacques Carette Director, Eastern Region. They are located in Vancouver and Ottawa. Their divisions will provide the link with the various industry sectors in Western and Eastern Canada. Dr. Jim Dangerfield joined us as Director, National Programs and is based in Vancouver. His programs, however, are located in both laboratories. As a result of the new structure, the organization will become decentralized to the greatest extent possible to provide a climate that combines creativity and accountability.

It is with great pleasure and pride that we acknowledge the commitment and hard work of Forintek staff. Forintek's success, after all, rests upon their creative and innovative ability, their experience and their desire to excel.

Research Program Committees

"The most effective research and development, we believe, is 'demand driven', where the research is undertaken in response to a clearly defined need." This quotation describes the philosophy which guides Forintek's Eastern and Western Research Program Committees, usually referred to as RPC 's.

The primary purpose of the RPC's is to provide a sharp focus for Forintek's program of work on the issues and opportunities facing the Canadian wood products industry and to ensure effective liaison between Forintek, and its industry and government partners.

During the past year, over 100 industry and government executives and technical specialists served as members of the Eastern and Western RPC's and their eight product sector and program area subcommittees.

The subcommittees met with Forintek managers and staff last fall to receive progress reports on projects underway and to provide advice and guidance for the planning of the program for 1985-86 and beyond.

Eastern and Western Research Program Committees met subsequently to coordinate the work of their subcommittees and to relate priorities to the industry's medium and long term needs. The RPC's are responsible to the Board and made their report in December.

The RPC Subcommittees and Committees also met in the spring to review the year's work and learn more about the research and development directions adopted for the coming year. This round of meetings completed the first implementation cycle of a new approach to R&D planning at Forintek which enhances the consultation process between Forintek, governments and industry.

Western Canada

N.R. Dusting, (Chairman)
Council of Forest Industries of British Columbia

J.M. Rustad
Rustad Bros. & Co. Ltd.

J.F. Newman
Weldwood of Canada Ltd.

H.G. Sander
Northwood Pulp & Timber Ltd.

C.R. Wilson
Crown Forest Industries Ltd.

J.A. Stevenson
MacMillan Bloedel Limited

K. Illiagworth
B.C. Ministry of Forests

H.P. Vokey
Canadian Wood Council

J.A. Brennan
Alberta Forest Service

D.R. Macdonald
Canadian Forestry Service

E. Kelly
Dept. of Regional Industrial Expansion

R.R. Affleck
Canadian Forest Products Ltd.

A. Rytz
Alberta Forest Products Association

M.S. Hollick
Pacific Wood Preservation Services Ltd

K.A. French
Forintek Canada Corp.

R.W. Stephens
Forintek Canada Corp.

J. Dangerfield
Forintek Canada Corp.

J. Carette
Forintek Canada Corp.

Eastern Canada

R.A. Nugent, (Chairman)
Consolidated Bathurst Inc.

G. Tardif
Les Industries Maibec Inc.

G. Malette
Waferboard Corp. Ltd.

G. Pagé
Le Groupe Gérard Saucier Ltée

B. Martin
Fraser Inc.

J.A. Stevenson
MacMillan Bloedel Limited

J-M. Poulin
Reader

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Canadian Home Builders Association

[illegible]
Canadian Wood Council

[illegible]
Kruger Inc. Canada Ltd.

[illegible]
Canadian Forestry Service

[illegible]
Dept. of Regional Industrial Expansion

[illegible]
Ontario Ministry of Natural Resources

[illegible]
Ministère de l'Energie et des Ressources

[illegible]
Conseil de la Recherche & Développement

[illegible]
Forintek Canada Corp.

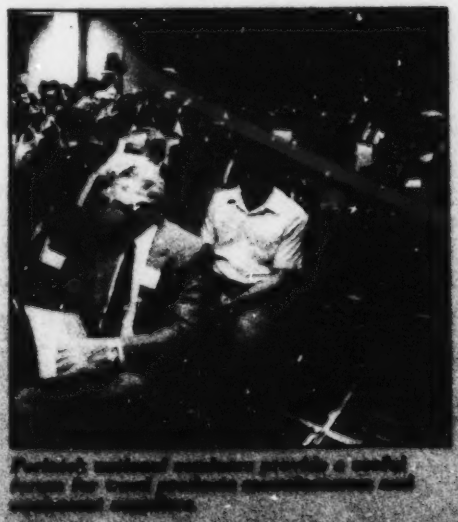
Program Achievements

In 1984-85, Forintek staff continued to focus on the needs of the Canadian wood products industry and those of its government partners, working in close cooperation with the members of the subcommittees of the Research Program Committees and with industry personnel across the country. This focus resulted in a wide range of achievements that will support the technological advancement of the industry.

TECHNOLOGY TRANSFER

In 1984-85, Forintek maintained its emphasis on industry workshops, seminars, courses and mill assessments of the best available technology. In doing so, Forintek staff achieved a high level of technology transfer to assist industry personnel in the effective application of the technological knowledge and developments which flow from wood products research. Forintek specialists in various departments and the Vancouver and Ottawa libraries also contributed to the technology transfer process by responding to requests for technical information from industry, governments and the general public.

Workshops and Seminars



Forintek's approach to technology transfer includes the provision of specialized training to industry personnel through regional workshops and regional seminars. The importance Forintek attributes to this form of technology transfer is reflected in the number of workshops and seminars held across Canada. In 1984-85, Forintek specialists organized and conducted 55 workshops attended by nearly 1,500 mill employees. The topics included saw maintenance, sawmill improvement, lumber size control and lumber drying.

Forintek continued to offer its correspondence course in lumber drying. The popularity of this program in 1984-85 is reflected by the enrolment of 42 mill employees who, upon completion of the course, received a Forintek certificate of study.

Forintek staff also organized two well attended national seminars. In November, more than 100 lumber manufacturing specialists from Western Canada gathered in Vancouver at the Scanning Technology for the Eighties seminar. Speakers discussed the most recent developments in fibre optics, lasers, ultrasound systems and sophisticated medical imaging techniques which may hold the key to the continued improvements in productivity and efficiency.

A few weeks later, 80 representatives of sawmills, lumber retailers and building contractors attended a seminar on finger-jointed lumber in Ottawa. Economists, equipment manufacturers, adhesives scientists, sawmill managers and government representatives discussed market opportunities for structural and non structural finger-jointed lumber and the technology which is currently available to manufacture this value-added product.

Mill Visits and Trials

In 1984-85, technology transfer also took the form of mill visits and mill trials which strengthened contacts between Forintek specialists and mill personnel.

In total over 150 mill visits were made to discuss sawmill and panelboard mill performance and efficiency, and the technological developments available to achieve improvements in these product sectors.

Technology transfer also involved Forintek specialists in 34 mill trials undertaken in cooperation with member companies to assess new technology or the efficiency of various manufacturing practices.

Sawmill Improvement Studies

Forintek, the Province of Quebec and industry have cooperated for the past two years in the Sawmill Improvement Program (SIP) to help softwood and hardwood lumber manufacturers conduct comprehensive analyses of their operations and to identify potential improvements that would flow from minor modifications to log conversion practices and processes. The program continued to be popular over the past year as Forintek specialists, assisted by staff from the Centre de recherche industrielle du Québec, conducted 17 mill studies in various regions of the province.

Responding to requests from industry across Canada, the SIP team began an analysis of the data collected during the 36 mill studies conducted in the province of Quebec since the beginning of the program. While the results of individual studies are confidential, a summary of the findings will help mill owners gain increased awareness of the potential additional benefits of improving bucking, log allocation and lumber size control, and of adopting strategies to reduce downtime and delays. The report on the Quebec SIP studies will also provide a basis to expand the program into Alberta and other areas of Canada.

The value of Forintek's Sawmill Improvement Program was recognized by the province of Nova Scotia. In October 1984, Forintek signed a contract to conduct sawmill improvement studies in the province and to conduct a series of seminars on various aspects of sawmill operations.

Terry Armstrong measures log length and log diameter on a sawmill log deck to determine the wood volume entering a sawmill which has requested a SIP study.

RESEARCH and DEVELOPMENT

Forintek's mission is to be the leading force in the technological advancement of the Canadian wood products industry through the creation and implementation of innovative concepts, processes, products and education programs. The unique partnership that has been established between Forintek and its federal government, provincial government and industry partners make it easier to fulfill this mission.

Forintek works closely with industry to find ways to adapt to a changing timber supply and to increase productivity and efficiency in its mills. It also provides technical data to ensure that Canadian wood products are treated equitably on international markets. Increasing competition among traditional wood products and from non-wood products in traditional wood markets places a high priority on technology for new and novel uses of wood in the future.

Forintek R&D also helps governments in their efforts to fulfill their mandates in the national resources sector, particularly in the areas of forest resource utilization and improvement.

Productivity and Efficiency — Lumber Manufacturing

Research and development in lumber manufacturing technology gives a high priority to technological innovation that will improve the productivity of wood conversion processes and practices. The major achievements in this sector over the past fiscal year can be grouped into several areas: saw technology, product quality, yield and protection, and resource utilization.

Saw Technology

Although many technological improvements have found their way into virtually every phase of sawmill operations in recent years, the key components of headrigs, resaws, edgers and trimmers remain band saws and circular saws. These are the workhorses of the industry. Forintek research and development in saw technology is directed towards extending saw working life, improving saw maintenance techniques, improving sawing accuracy and lumber surface quality.

In 1984-85, Forintek specialists continued earlier research which demonstrated that stellite tipped saws exhibit vastly superior wear and corrosion resistance compared to standard saws. This year's work resulted in the establishment of optimal parameters for stellite tipped sawtooth geometry to ensure maximum performance in reducing the surface roughness of cut lumber, sawing variation and power consumption. Over 30 mills now use this technology.

Forintek scientists also addressed the problem of reduced sawing accuracy associated with processing frozen wood. A design was developed for a new sawtooth gullet that retains nearly twice as much sawdust in the gullet as standard designs. This reduces sawdust spillage and thus friction between the saw blade and cut lumber surfaces which adversely affects saw behaviour in frozen wood.

Forintek engineers also designed a new type of bandsaw roller guide in 1984-85 with a view to reducing mill maintenance costs.

Based on the results of mill trials and current knowledge of the long term performance characteristics of roller bearings, the new roller guide is expected to be maintenance free for periods of up to 12 months.

Research also focused on improving the overall cutting performance of band saws. Thanks to the cooperation of six sawmills, Forintek specialists were able to demonstrate that side grinding of band saws considerably reduces deviations in tooth width and alignment and results in a significant reduction of lumber surface roughness. Specialists believe that the reduction in surface roughness due to side grinding of band saws can increase lumber recovery by as much as one percent and also improve the economics of planing operations.

In conjunction with this work, Forintek research scientists developed a procedure to accurately determine the minimum side clearance value for band saws. Discussions with mill personnel indicate that most sawmill operators are either unaware that their side clearances are excessive, or unable to determine the minimum side clearances for their saws. They pay the price in lumber recovery losses.

Circular saw research in 1984-85 focused primarily on untensioned saws. Efforts to achieve savings in not having to tension saws led to the development of the Detenso saw in Germany several years ago. In 1984-85, a joint project with a Forintek member company demonstrated that Detenso saws can probably perform as well as standard saws in gang edgers once the fundamental vibration characteristics and critical speed values have been established.

David Mayer and Jim Swanson (seated) discuss features of the new bandsaw roller guide developed at Forintek.

Product Quality, Yield and Protection

In the fall of 1984, Forintek released an enhanced version of the lumber size control program launched in the late 70's, which has enabled sawmills to increase their lumber recovery by as much as four percent. The new version of Forintek's program, which was designed for use with IBM-PC and compatible microcomputers, offers the capability of using control charts to monitor sawing performance at each machine centre on a shift by shift basis.

Forintek specialists in sawmilling research also studied the efficiency of two-saw and multiple saw trimmers in cooperation with member companies. This work led to the development of an evaluation procedure to help sawmillers to determine the efficiency of various green trimmer operations. Other work in this area resulted in the development of a theoretical method for determining the effect of scan spacing on trimming efficiency, thus providing sawmillers with tools to make sound financial decisions when considering trimmer optimizing systems.

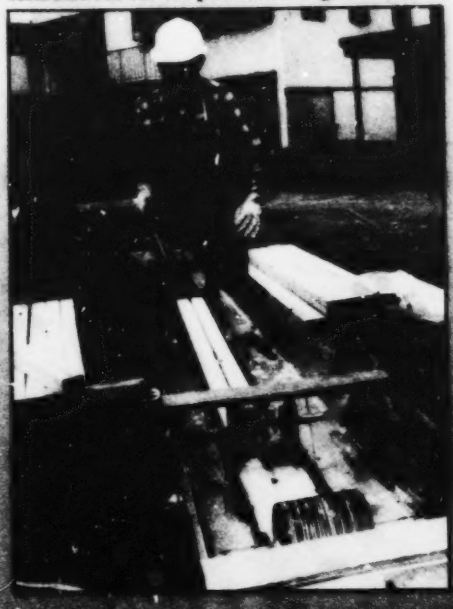
In wood drying and seasoning, efforts over the past year included a series of field evaluations of kiln installations. The evaluation findings will help lumber manufacturers across the country assess the effectiveness and efficiency of their kiln drying facilities and practices, and alleviate product quality problems associated with final moisture content, kiln degrade and long drying times.

In addition to assessing kiln drying facilities, Forintek lumber drying experts conducted a comprehensive assessment of eight recently introduced computer-based kiln control systems which claim reduced

Steve Wang runs the new LUSI program he developed for lumber size control on an IBM-PC microcomputer.

Graham Mackay (left) and Dal Wright measure the moisture content of kiln dried lumber during a kiln evaluation study for a Forintek member company.

Tony Cserjesi dips lumber in a semi-automatic dipping trough developed at Forintek as part of a study to evaluate non chlorophenol fungicide formulations for the protection of green lumber.



drying time and energy costs as well as improved grade recovery. Forintek's analysis of these systems found that they are based on sound principles and should result in substantial improvements in kilns which have been determined to be in good running order.

The wide variation in the moisture content of wood going into kilns continues to pose major problems to lumber manufacturers. On-line moisture metering systems have not proven to be accurate enough to sort lumber into specific moisture content ranges prior to loading the kiln. In 1984-85, Forintek research resulted in the development of an on-line moisture measuring system which is extremely accurate over a very wide moisture range. Although initially developed for veneer, the new system has been tested in mill trials with Douglas-fir and hem-fir lumber, and has yielded excellent results. Work is underway with suppliers to produce a commercial model.

In 1984-85, Forintek also undertook fundamental research in lumber drying. A new three-year project launched last fall will carry out a comprehensive study of moisture transport phenomena and stress development in wood during drying. The findings of this work will serve as the basis for developing a computer model to predict the results of the drying process for a wide range of species and products.

In the area of wood protection, Forintek scientists continued research on the development of reliable and inexpensive analytical techniques to evaluate the efficiency of wood protection treatments. Following the decision by the major North American supplier of chlorophenols to cease production of these preservatives, Forintek and the Council of Forest Industries of British Columbia jointly sponsored a workshop to discuss opportunities for the treatment of lumber. The workshop was attended by 60 representatives from sawmills, chemical suppliers and government, and provided an excellent opportunity to develop an understanding of the problem and to propose a course of action for the future.

Resource Utilization

During the past year, work progressed on several projects to provide guidance to lumber manufacturers in optimizing lumber recovery from a changing forest resource. One of the projects compared the yield efficiency for seven British Columbia mills which represent a cross-section of sawmilling technology. The study demonstrated that technological improvements can indeed result in high lumber yields but that close attention to basic manufacturing practices such as lumber size, sawing patterns and log allocation can improve the yield performance of the most technologically advanced mills.

Another project focused on the identification of processing options for small diameter hardwood logs. Productivity, lumber volume and grade recoveries associated with the four hardwood processing systems most commonly used in Eastern mills were determined. The results will facilitate decision-making related to log purchasing, allocation and conversion, marketing and mill expansion.

The past year's work resulted in the publication of two fundamental economic reports. One discusses the major factors that warrant

change in the Canadian sawmilling industry. The other is an assessment of the industry's competitive position in international softwood markets. This work will provide the basis for ongoing monitoring of indicators of the industry's competitive position, and of market constraints and opportunities for communication to Forintek member companies.

André St-Laurent (left) and Bill Love try out an automated lumber size data collection system developed by Forintek sawmilling specialists.

Productivity and Efficiency — Panel Products

In recent years, it has become increasingly apparent to plywood manufacturers that delivered wood costs, labour costs, processing costs associated with aging technology and a decline in the traditional markets for plywood are adversely affecting the cost competitiveness of plywood as a structural building material compared to other panel products.

Manufacturers of waferboard, on the other hand, realized that their product was limited to applications in a relatively dry environment.

The major thrusts of composite products research at Forintek have therefore focused on technological innovations to reduce the cost of manufacturing plywood, improve the performance of waferboard and provide a basis for expanded use of this product.

Forintek's Don Walser operates the spindleless lathe in mill trials at Weldwood of Canada's New Westminster plant.

Peter Tanguff tests the automatic pitch control system on Forintek's laboratory lathe.

Plywood

One of Forintek's most significant activities in plywood research during the past year focused on the development of innovative peeling technology. This involved a joint effort between Forintek, one of its member companies and a lathe manufacturer in the evaluation of a prototype spindleless lathe under production conditions.

An elegantly simple concept, the spindleless lathe promises to significantly broaden the resource base for plywood manufacturers. It will enable them to peel logs that are unsuitable for peeling with conventional lathes. The prototype was designed to peel 7½-inch diameter bolts down to a 2½-inch core. To further develop the concept, Forintek and Durand-Raute have undertaken to jointly design and produce a prototype lathe capable of peeling 14-inch bolts of variable length.

Efforts to increase the efficiency of current peeling technology resulted in the development of an experimental automatic pitch control system for veneer knives to compensate for varying wood characteristics. This development will reduce production losses due to thickness variability, surface roughness and block spinout. Testing of the system also demonstrated that good quality veneer was produced in the absence of a nosebar, a standard component of conventional lathes.

The absence of a nosebar has permitted Forintek researchers to experiment with a simple incising roller on Forintek's laboratory lathe. This incising system is based on German needle incising technology for wood preservation and a Japanese lathe incisor design. Forintek scientists have built and tested a prototype on a four-foot laboratory lathe and have produced good quality veneer with incisions that are not visible to the naked eye. The potential commercial impact of this technology is considerable, particularly when it is linked to the spindleless lathe concept. Forintek experts anticipate that it will result in improved handling of veneer in automated systems, reduced drying times, reduced blows during pressing and the manufacture of a glued product that is much more receptive to pressure treatment with wood preservatives.

Finally, plywood research scientists developed a new moisture measuring system to measure the moisture content in unseasoned

veneers and lumber on the production line. A portable unit was built and tested in the field. Results demonstrated that the new system is much more accurate than commercially available systems in effectively sorting lumber and veneer by moisture content ranges, for more efficient drying and less degrade.

Waferboard

Increasing competition in traditional waferboard markets resulting from high production capacity and declines in residential construction place a high priority on the development of new waferboard products that will broaden the market for Canadian waferboard manufacturers.

In 1984-85, Forintek scientists developed two processes for the improvement of the dimensional stability of waferboard which may well be key factors in expanding current applications and increasing competitiveness. The two patent applications filed for these processes may lead to a whole new generation of dimensionally stable composite products. The processes have also been shown to improve the surface characteristics of waferboard panels, and this could open new opportunities in markets requiring better finishing characteristics.

Testing Services

In 1984-85, Forintek maintained testing services for Canadian manufacturers to measure the level of formaldehyde emissions from panel products. Plans were also developed to provide a unique testing service to help manufacturers comply with a new formaldehyde emission regulation established by the U.S. Department of Housing and Urban Development.

Product certification to comply with this new regulation will require a test that yields emission values that correlate more accurately with in-service emissions. There are few testing facilities in the United States equipped to perform this test, and none in Canada. Forintek will therefore upgrade its formaldehyde emission testing facility in Ottawa with the addition of a room testing chamber to assist panel product manufacturers to comply with the new regulation that governs the use of their products in the U.S. market.

Gérald Bastien (left) and Ernest Hsu discuss the surface characteristics of a waferboard produced at Forintek.

Roger Aston conducts a formaldehyde emission test for in-plant quality control.

Compression test on one of the 30,000 pieces of lumber tested by Forintek as part of the Canadian Wood Council's In-Grade Testing Program.

Hankey Fraser sets up a load test to determine adjustment factors for spruce lumber in bending.

Technical Support to Marketing

Approaches to the development of codes and standards in the industrialized world are changing, particularly in the area of building codes for light frame construction. Moreover, there is increasing competition in this major market for Canadian wood products from other building materials such as concrete, steel and plastics.

The Canadian wood products industry therefore requires accurate and independent technical data to ensure the equitable evaluation and continued acceptance of its products by codes and standards authorities in domestic and export markets. Such data are also required to expand the use of wood through the development of new value added products which can lessen the industry's historical dependence on commodity markets.

Forintek's unique facilities and expertise in wood engineering enable it to address these challenges and to provide the industry with vital marketing support. Program achievements in this area are related to two major ongoing research programs. The first is the lumber testing phase of the In-Grade Testing Program undertaken two years ago at the request of the Lumber Properties Steering Committee of the Canadian Wood Council. The second is the Canada-U.S. Light Frame Structures Research Program.

Lumber Testing

The lumber testing phase of the In-Grade Testing Program was completed in 1984-85. This involved the compilation of the results of bending, tension and compression tests on more than 30,000 pieces of lumber supplied by the industry all across Canada. In the second phase of the program, Forintek scientists began the statistical analysis of data generated by the lumber testing program using the same statistical analysis procedures as are being used by the U.S. Forest Products Laboratory, which is performing similar work on behalf of the U.S. industry. Every effort is being made by Forintek and the Lumber Properties Steering Committee to ensure the most complete compatibility between Canadian and U.S. data and analytical procedures.

Light Frames Structures Research

Work under the Canada - U.S. Light Frames Structures Research Program involved continuing Duration of Load studies for spruce dimension lumber. Forintek Wood Engineering specialists also developed Duration of Load models to relate the short term strength data of dimension lumber to the long term performance of lumber in various commercial applications. Data generated from this research will be invaluable in identifying new applications for wood in light frame construction systems.

Another area of Canada-U.S. cooperation under the Light Frames Structures Research Program involves research into the performance of wood truss and roof systems. In 1984-85, research resulted in the development of a truss structural analysis program and a roof system computer model. These analytical tools will enable Forintek scientists to carry out simulation studies on truss and roof system performance and, eventually, to help to determine engineering design values that prevent overdesign and increase the competitiveness of wood in engineered structures.

Opportunities with Wood

Forintek's efforts to enhance the competitiveness of the Canadian wood products industry include research and development activities which focus on technological innovations that promise to expand the use of wood in existing markets and facilitate access to new market opportunities. During the past year, research in this area centered on building construction technology and wood preservation.

Building Construction Technology

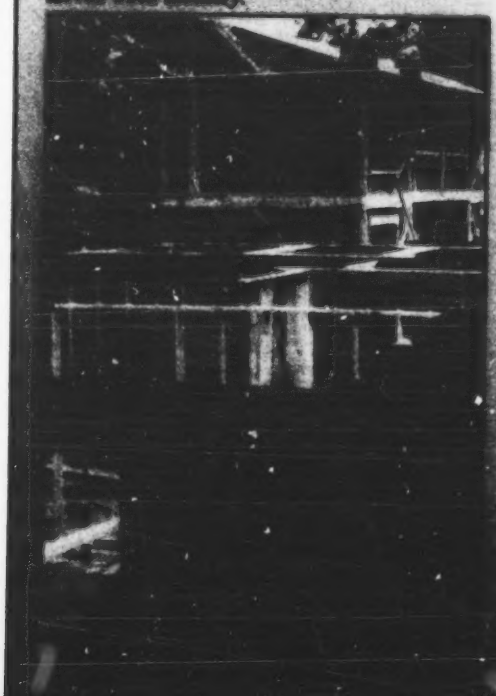
The goal of building construction technology research at Forintek is to provide a technical base to ensure the continued use of wood-based systems in building construction and the acceptance of wood-based building systems where wood is not traditionally used.

Changes in construction techniques in the 70's led to homeowner complaints about the flexibility of floor systems. In 1984-85, Forintek scientists analyzed the results of past floor system surveys and assessments of floor construction and performance in five metropolitan areas across Canada. The findings should help the building industry in designing wood floor systems which are more acceptable to consumers.

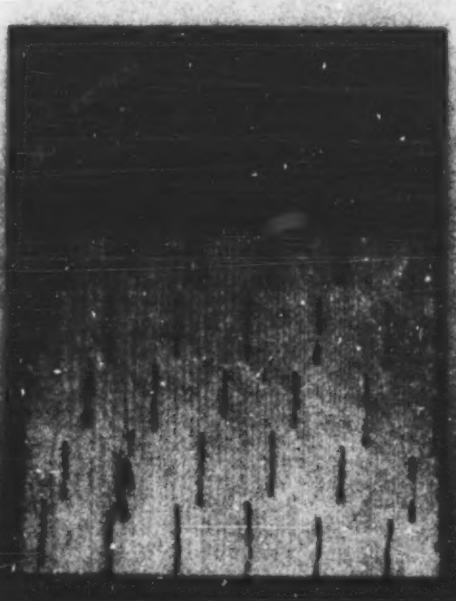
During the past year, Forintek fire research specialists also assessed the effectiveness of proprietary fire retardant coatings to increase the fire resistance of purlins and other decking materials used for heavy duty floors and ceilings. Research results demonstrated that it is technically feasible to increase the fire resistance rating of heavy timber roof and ceiling construction systems to more than one hour.

Research to provide technical data to the construction industry also focused on preserved wood foundations. There are approximately 50,000 houses in Canada built on preserved wood foundations. This is one of the largest potential growth areas for preserved wood products in Canada with growth estimated at 1.5 percent per year. In 1984-85, Forintek undertook a nation-wide survey of occupants of houses built with preserved wood foundations. Responses are still coming in and analysis of the data has not yet begun. The results of this survey, however, will expand the data base on the durability of PWF materials and will be invaluable in the further development of PWF treatment systems and construction methods.

Jean-Claude Geraut adjusts floor deflection measuring devices.



Needle incising (top photo) provides for deeper and more even penetration of wood preservatives (and better appearance) in western white spruce.



Wood Preservation

In the context of added value products and market diversification, treated wood is the fastest growing sector of the wood products market in North America. Preserved wood represents about 10 percent of total lumber consumption at present, and is expected to at least double within the decade. In 1984-85, Forintek reassessed its program in this important area and has developed a revitalized program that is strongly supported by the treated wood industry across Canada. Three program areas are noteworthy.

Assessment of needle incising technology developed in Germany demonstrated that difficult-to-treat Canadian species such as spruce can be treated to Canadian standards. Needle incising also preserves surface appearance as well as lumber stiffness and strength. A prototype incising machine will be evaluated in Canada in the coming months.

In 1984, Forintek finalized the design and plans for the establishment of the most advanced facility for accelerated biodeterioration in Canada. The facility, which is under construction, will allow important information about treated wood performance, treatment chemicals and methods to be developed in about one-tenth of the time normally required in field tests.

Forintek's ongoing field testing program was very active during 1984-85, with extensive testing of various products and preservatives carried out at four land and two marine sites across Canada. Research on the performance of treated and untreated wood products enables Forintek to make recommendations to codes and standards authorities and manufacturers of treated wood products on preservation and treatment methods to increase product durability.

Adapting to a Changing Timber Supply

The increasing trend toward second growth timber and intensive forest management practices in virtually every region of the country poses several challenges to foresters and manufacturers of wood products. While foresters address the challenge of growing better trees more quickly, manufacturers wonder about the quantity, quality and economics of the products they will produce from the trees of the new forests, which present new and different technical properties.

Forintek's unique research capabilities in wood characterization place it in an excellent position to serve as the technological bridge between the managers of the forest resource and the manufacturing sector.

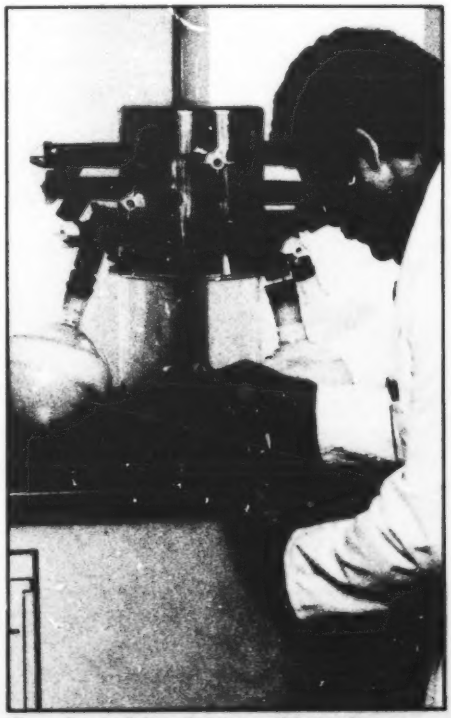
The past year saw the culmination of two years of research to explore the properties and the extent of juvenile wood in five British Columbia coniferous species from second-growth forest stands. The findings of this research provided the basis for the formation of a Douglas-fir Task Force with representation from the wood products and the pulp and paper sectors of the forest industry.

On behalf of the Task Force, Forintek developed a major research effort that includes eight integrated research projects. These will focus on basic wood and pulp properties, and log and grade recovery studies. Lumber produced from sample trees by a cooperating company will be used to conduct drying and in-grade testing studies. The suitability of small diameter top logs and thinnings for processing in a spindleless lathe to produce laminated veneer lumber will be explored. Forintek scientists will also assess the effect on end product quality of silvicultural treatment and the biological process of transition from juvenile to mature wood in managed forest stands.

For years, Forintek wood science specialists have evaluated the density of thousands of wood increment cores taken from candidate plus-tree and parent trees in support of genetic improvement programs for western coniferous species. In 1984-85, discussion of the results of this work with Tree Improvement Councils in every province of the country revealed that those responsible for the renewal and management of Canada's forests are very concerned about wood quality and interested in any new developments in this area. Forintek will play a leadership role in this area by organizing the Wood Quality Workshop to be held in connection with the forthcoming biennial Canadian Tree Improvement Association meeting.

There is a tremendous need in tree improvement work in Canada to rapidly assess the wood density of potential parent trees or of young trees in progeny tests. The absence of a rapid field method to do so, however, is a major constraint to wider acceptance of wood density as a selection criterion in tree improvement programs. In 1984-85, Forintek wood characterization specialists developed a method to indirectly measure wood density, which sets the stage for the design of an instrument to make it possible to use the method in the field.

Jane Richards and Bob Kellogg examine a cross-section of second growth Douglas fir. The dark circle indicates the boundary between juvenile wood and mature wood.



Gerry Louis-Seize, about to subject micro-organisms to freeze-driving, a more effective and efficient method of storing the bacteria, yeasts and fungi of Forintek's collection of wood inhabiting microorganisms.

Biotechnology

The major emphasis of the Biotechnology program continues to address the under utilization of the wood resource. Approximately 25-60% of the tree is not utilized or is converted into low value products. Biotechnology offers an added-value opportunity to the industry by making use, for example, of decadent wood, sawmill residues and waste lignin, and converting them into higher value products such as sugars, chemicals and resins.

Past work has demonstrated that it is technically feasible to convert various wood residues into these products and this has been demonstrated at the laboratory scale. During the past year Forintek began to integrate the different components of this work into a process development unit which will allow Forintek to determine the cost of carrying out the various process steps. This information is required to help establish a demonstration plant which will be used to show the various higher value products that can be made from wood residues.

A market analysis study to determine the range and quantities of lignin derived products that could be marketed was also initiated.

Studies have also shown that Biotechnology can be used to increase the durability of wood products. During the past year, research was undertaken on the use of microorganisms to increase the permeability of wood and enhance the effectiveness of wood preservation treatments. Other efforts explored the effectiveness of biological control as a method of increasing the resistance of treated wood products and lumber to decay.

Innovators

In 1984-85, the work of several Forintek scientists resulted in technological innovations which promise significant gains in productivity and reductions in manufacturing costs, and for which patent applications have been filed.

Spent Sulphite Liquor-Based Adhesive

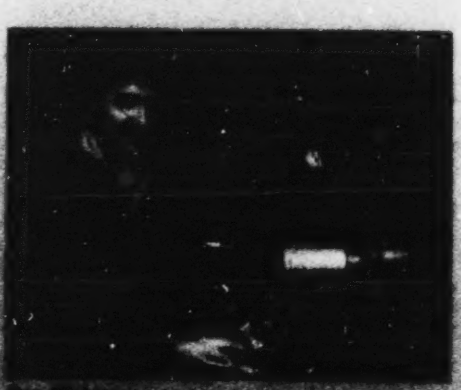
Louis Calvé and Gilles Brunette of the Ottawa Composite Products Department developed a new adhesive system for the production of waferboard. The major component of the new system is spent sulphite liquor, a by-product of the sulphite pulping process.

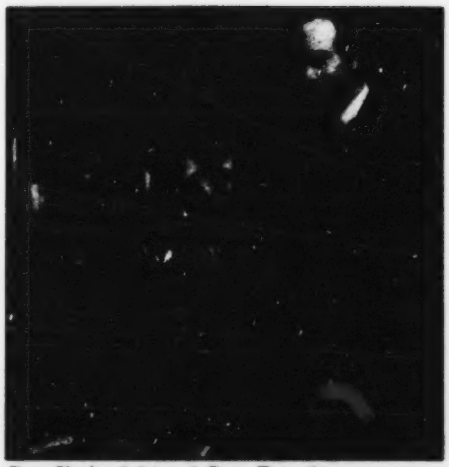
The new adhesive system presents several major benefits for waferboard manufacturers. First, it costs less than traditional waferboard adhesives because of the lower cost of the major component and the ease with which it can be produced. Second, because the system requires no change in current processing techniques, manufacturers will be able to use it to make exterior grade waferboard which meets CSA standards. A third benefit, and a significant one, is that interior grade panels produced with this adhesive have shown no formaldehyde emissions. Furthermore, this new adhesive system has eliminated the problem of caul plate sticking associated with the use of lignin binders.

Louis Calvé (left) and Gilles Brunette

New Veneer Lathe Chuck

Don Walser of the Vancouver Composite Products Department has developed a new chuck for veneer lathes. Typically, eight to ten percent of veneer blocks processed with traditional chucks split and spin off the lathe as a result of splitting of the block ends by the chucks. The new type of chuck invented by Walser and tested commercially with the cooperation of Evans Products, Golden, B.C. has a different design. The new design results in a dramatic reduction of longitudinal splitting of blocks and subsequent spinout. Use of this chuck will thus increase veneer yield. It grips block ends securely and permits transmission of the peeling torque more effectively than standard chucks. The new design is expected to result in smoother lathe operation and less damage to chucks caused by knots or other physical defects in veneer bolts.





Ray Clarke (left) and Gary Troughton

New Moisture Sensor

Ray Clarke and Gary Troughton of the Vancouver Composites Department have developed a new moisture sensor capable of rapidly determining the moisture content of green wood. In tests on a 600 feet-per-minute veneer line in the laboratory and on a hemlock and Douglas-fir line in a member company mill, the sensor has given accurate readings at moisture levels up to 250 percent.

One of the main applications for this sensor equipment would be the automatic sorting of wood products prior to drying. While substantial technological advances have been made in dryers for veneer and lumber in recent years, variations in moisture content of lumber and veneer continue to pose a problem. The new moisture sensor will make it possible to sort more effectively by moisture content and to enhance the efficiency of the drying process.

The new sensor is expected to be particularly useful in mills processing the S-P-F. species group where very wet balsam fir creates major drying problems. In plywood mills, it will improve already sophisticated mechanical sorting systems

Methods for Improving the Dimensional Stability of Waferboard

Ernest Hsu of the Ottawa Composite Products department has developed two processes for producing highly stable waferboard.

One of these processes involves steam treatment of wafers. Experimental waferboards made with this process showed a great improvement in thickness stability and bond durability. The other process subjects conventional waferboards to a special heating process which also results in increased thickness stability and bond durability.

Both these processes are simple and can be applied in-line so as to treat either a mill's entire production or only that volume of product which requires treatment to ensure improved stability.

It is Forintek's policy to grant royalty free, non exclusive licences to its member companies to use or implement Forintek-owned patents that result from research jointly funded by members and the federal and provincial governments. Inquiries should be directed to the President.

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Alberta Forest Products Association

Cariboo Lumber Manufacturers' Association

Council of Forest Industries of B.C.

Interior Lumber Manufacturers' Association

Northern Interior Lumber Sector of the Council of Forest Industries of B.C.

Quebec Lumber Manufacturers Association

The Waferboard Association

A wood products association is granted membership status if the aggregate shipments of those of its members who support Forintek represent 70 per cent of the shipments of the association's total membership.

ALBERTA

A & V Logging Ltd.
Alberta Stake & Lath Ltd.
Armbruster Lumber Ltd.
Bissell Brothers Lumber Ltd.
Blue Ridge Lumber (1981) Ltd.
Boucher Brothers Lumber Ltd.
Brewster Construction Ltd.
Buchanan Lumber
Centennial Lumber Ltd.
Charles H. Fluet Lumber Ltd.
Double D. Dowels Ltd.
Double R. Forest Products
E.N.A.P. Woodcraft Ltd.
Ed Bobocel Lumber Co. Ltd.
Erith Tie Co. Ltd.
Grove Lumber & Manufacturing Ltd.
Henry Vasseur Custom Planing Ltd.
Johnson Brothers Sawmills Ltd.
Karpiuk Brothers
L.H. Rehn
Michael's Forest Products Ltd.
Millar Western Industries Ltd.
Mostowich Lumber Ltd.
Natal Forest Products Ltd.
Negraiff Lumber & Construction Ltd.
Northland Forest Products Ltd.
Pelican Spruce Mills Ltd.
Procter & Gamble Cellulose Ltd.
Revelstoke Lumber
Rocky Wood Preservers Ltd.
Saddle Lake Band
Spray Lake Sawmills (1980) Ltd.
Spruce Valley Mills
Spruceland Millworks Ltd.
St. Jean Lumber
St. Regis (Alberta) Ltd.
Svedberg Lumber Co. Ltd.
Tall Pine Timber Co. Ltd.
Vanderwell Contractors (1979) Ltd.
W.B. Forest Products Ltd.
Westmark Products Ltd.
Zavisha Sawmills Ltd.
Zeidler Forest Industries Ltd.

BRITISH COLUMBIA

Ainsworth Lumber Co. Ltd.
Apollo Forest Products Ltd.
Ardew Wood Products Ltd.
Atco Lumber Ltd.
Babine Forest Products Ltd.
Balfour Forest Products Inc.
Brink Forest Products Ltd.
British Columbia Forest Products Ltd.
C & C Wood Products Ltd.
CIP Forest Products Inc.
Canfor Corporation
Clearwater Timber Products Ltd.
Crestbrook Forest Industries Ltd.
Crown Forest Industries Ltd.
Dunkley Lumber Ltd.
Evans Products Company Ltd.
Federated Co-operatives Ltd.
Gorman Bros. Lumber Ltd.
Houston Forest Products Ltd.
Jacobson Bros. Forest Products Ltd.
Khalsa Enterprises Ltd.
Lakeland Mills (1973) Ltd.
Landucci Lumber Ltd.
Lignum Ltd.
Lytton Lumber Ltd.
MacMillan Bloedel Limited
Mill & Timber Products Ltd.
Nechako Lumber Ltd.
Northwood Pulp and Timber Ltd.
Pinette & Therrien Mills Ltd.
Pope and Talbot Ltd.
Rustad Bros. & Co. Ltd.
Slocan Forest Products Ltd.
The Pas Lumber Company Ltd.
Weldwood of Canada Ltd.
West Fraser Mills Ltd.
Weyerhaeuser Canada Ltd.

NEW BRUNSWICK

Fraser Inc.

ONTARIO

Dubreuil Brothers Limited
Great Lakes Forest Products Ltd.
Waferboard Corporation Ltd.

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Adelard Moisan Ltée
Bois Laurentien Inc.
Chassé Inc.
Cie. Joseph Audet Ltée
Consolidated-Bathurst Inc.
Donohue St-Felicien Inc.
Eloi Moisan Inc.
Félix Huard Inc.
Gérard Crête et Fils Inc.
Howard-Bienvenu Inc.
Industries Maibec Inc.
La Scierie Taschereau Inc.
Les Industries Georges Deschênes Ltée
Les Produits Forestiers Saucier Ltée.
Matériaux Blanchet Inc.
Normick Perron Inc.
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Scieries Saguenay Ltée
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